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(54) **Collapsible box-shaped container with reinforced corners and blank therefor**

(57) The present invention relates to a collapsible box-shaped container comprising a substantially rectangular shaped bottom (2), a first pair of upright side walls (6) positioned on a first pair of opposite sides (7) of the bottom (2) and a second pair of upright side walls (4) positioned on a second pair of opposite sides (5) of the bottom (2) connecting the side walls of the first pair (6), a first diagonal folding line (39) extending upwardly from both opposite bottom corners (16) of each side wall of the first pair (6) towards an upper edge (10) thereof to permit the container to be collapsible, adjacent side walls of the first (6) and second pair (4) being attached to each other by a corner construction, the corner construction comprising a lengthening flap (20), a connection flap (42) and a fastening flap (43). The corner construction further comprises a reinforcing piece (59) with a first flap (25) extending along the side wall (6,4) providing the lengthening flap (20) and a second flap (26) extending along the lengthening flap (20), the first and second flap being connected to each other along a fourth upright folding line (36).

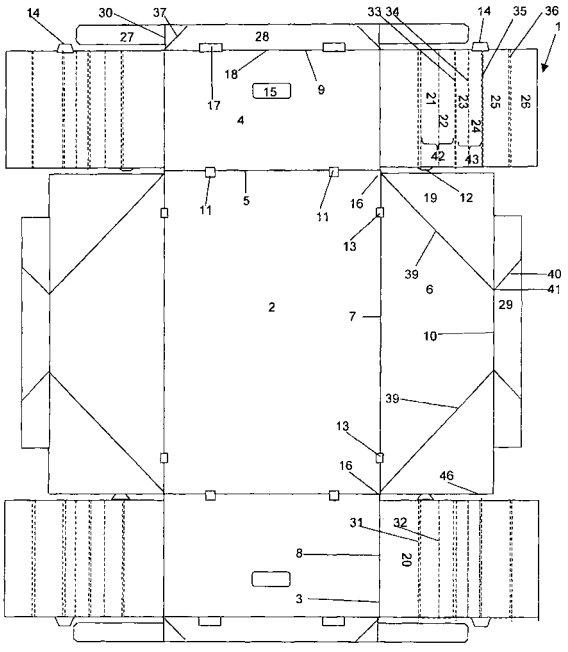

Fig. 2

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Description

[0001] The present invention relates to a collapsible box-shaped container comprising a substantially rectangular shaped bottom, a first pair of upright side walls positioned on a first pair of opposite sides of the bottom and a second pair of upright side walls positioned on a second pair of opposite sides of the bottom connecting the side walls of the first pair, which together define an inner storage volume of the container, a first diagonal folding line extending upwardly from both opposite bottom corners of each side wall of the first pair towards an upper edge of the first pair of side walls, the diagonal folding line allowing the box-shaped container to be collapsible, adjacent side walls of the first and second pair being attached to each other by a corner construction, the corner construction comprising

(a) a lengthening flap, which extends from an upright side of a side wall along a first upright folding line and is fastened with at least part of an outer face to part of an inner face of an adjacent side wall facing the inner storage volume,
(b) a connection flap, which extends from an upright side of the lengthening flap along a second upright folding line on a side opposite the first folding line, and is double-folded thereon, and
(c) a fastening flap which extends from the connection flap along a third upright folding line, on a side of the connection flap opposite the second folding line, the fastening flap extending along the side wall providing the lengthening flap, according to the preamble of the first claim.

[0002] Such a collapsible box-shaped container is known from EP-B-0.621.192. The known container comprises a bottom and two pairs of opposed upright side walls which are folded approximately square to the bottom. Opposed ends of the side walls of a first pair of upright side walls are provided with lengthening flaps, which are folded square to the side wall. The part of the outer surface of the lengthening flap above the diagonal folding line is fastened to an adjacent side wall of the second pair of opposite side walls. Each lengthening flap is provided with a connection flap which is double-folded on the lengthening flap, the connection flap having substantially the same length as the lengthening flap. The connection flap is provided with a fastening flap, which is folded approximately square with respect to the lengthening flap and is glued to the wall providing the lengthening flap. The adjacent side wall of the other pair comprises two folding lines which extend diagonally from the bottom corner towards the top rim and point at an acute angle to ensure that the container is collapsible. In EP-B-0.621.192 each side wall panel of the first pair of side walls comprising the lengthening flaps is provided with a widening strip along a top edge of the panel and connected to it along a horizontal folding line. The widening strip comprises a diagonal folding line, which extends from each end point of the horizontal folding line. A retaining flap extends from both ends of the widening strip along another folding line. The retaining flap is glued to a side wall of the second pair. EP-B-0.621.192 further discloses that the box-shaped container can be manufactured from a single blank. The blank thereto provides different cuts and folding lines between the different parts of the container so they can be folded and glued to each other to obtain the collapsible box-shaped container.

[0003] The collapsible box-shaped container disclosed in EP-B-0.621.192 however has the disadvantage that the load bearing capacity and the compression value of the corners, even with the presence of the lengthening flap, the connection flap and the fastening flap in the corner, is still insufficient.

[0004] There is thus a need for a collapsible box-shaped container with an improved load bearing capacity and/or compression value.

[0005] Accordingly, it is the object of the present invention to provide a collapsible box-shaped container with an improved load bearing capacity and/or compression value.

[0006] This is achieved according to the present invention with a collapsible box-shaped container showing the technical features of the characterising portion of the first claim.

[0007] Thereto, the corner construction further comprises a reinforcing piece comprising a first flap which extends along the side wall providing the lengthening flap and a second flap extending along the lengthening flap, the first and second flap being connected to each other along a fourth upright folding line.

[0008] The inventor has found that by inserting the above-described reinforcing piece into the corner of the box-shaped container, the corners are further reinforced. In particular, a surprisingly larger load bearing capacity and/or compression value is achieved for the container thus enlarging the number of containers that can be stacked upon each other and/or the load of each container. The risk that a container succumbs under the load of containers stacked on top of that container is thus reduced, accordingly enlarging the reliability of the containers while stacked.

[0009] The inventor has further found that the box-shaped container of this invention may be made of a sheet material with a reduced thickness, i.e. a reduced weight per square unit of surface area as compared to the state of the art container, without however adversely affecting its load bearing capacity. In this respect, the inventor has found that the weight per square unit of surface area of the material may be reduced with at least 10%, often at least 20%, sometimes even 25%. Although a blank with a somewhat larger surface area is needed to construct the container because it needs to include the reinforcing piece, the inventor has found that the total material cost may be reduced.

[0010] Due to the presence of the reinforcing piece,

the container can be made of a material which shows the optimum compromise between sufficient rigidity on the one hand, to permit that the container retains shape when loaded during use, and sufficient flexibility on the other hand to permit that the container as a whole can absorb at least a portion of the load caused by stacked containers on top of it. Containers made of a too sturdy material show an increased risk to buckle under a large load. Containers made of a too flexible material run a risk that they succumb under the load of superposed containers and loose their shape.

[0011] The reinforcing piece may be made as a separate part or may be made in one part with the fastening flap. In the latter case the first flap of the reinforcing piece is connected to an upright side of the fastening flap along a fifth folding line.

[0012] The reinforcing piece can be made of the same material as the container or of a different kind of material, e.g. a stronger type of cardboard with a higher thickness than the rest of the container, avoiding the cost of making the whole of the container of a stronger, more expensive material. The presence of the reinforcing piece permits to adapt the load bearing capacity of the container in particular to adapt the load bearing capacity to the needs of the customer, at minimal cost i.e. without having to change the material or the thickness of the material of which the remainder of the container is made. Or in other words the presence of the reinforcing piece permits to adapt the load bearing capacity of the corners without changing the material of which the remainder of the container is made.

[0013] In a preferred embodiment of this invention the box-shaped container is characterised in that the first flap of the reinforcing piece is positioned between the fastening flap and the side wall providing the lengthening flap, in that the second flap of the reinforcing piece is positioned between the lengthening flap and the connection flap and in that the fourth folding line is positioned on a diagonal line of the bottom connecting opposite diagonal corners. This is done to ensure that the container remains collapsible regardless of the large amount of material present in the corner and to decrease the tension on the reinforcing piece thus reducing the risk that the reinforcing piece buckles, when the container is erected. This positioning of the reinforcing piece, when erecting the container from the folded blank, provides an optimum compromise between giving each flap sufficient mobility on the one hand and sufficient rigidity confining all flaps in their position once the container has been erected to provide a large compression value and/or load bearing capacity on the other hand.

[0014] A further preferred embodiment of the box-shaped container is characterised in that the connection flap comprises at least one upwardly extending set of creases and/or folding lines dividing the connection flap in at least a first part distal from the fastening flap and a second part proximal to the fastening flap, the first and second part being positioned angled with respect to each other, thus providing an enlarged corner area which extends into the inner storage volume of the container. In that way the surface area of the bottom wall responsible for bearing capacity may be enlarged without giving up a significant part of the storage volume.

[0015] Preferably the fastening flap comprises at least one upwardly extending set of creases and/or folding lines dividing the fastening flap in at least a first part proximal to the connection flap and a second part distal from the connection flap, the distal part being fastened to the first flap and/or the side wall providing the lengthening flap, the first and second part being positioned angled with respect to each other, thus providing an enlarged corner area which extends into the inner storage volume of the container.

[0016] A benefit of the presence of the creases and/or folding lines is that the different parts of the corner construction deform in a predetermined way along the different creases and/or folding lines when erecting the container from the folded blank in stead of running the risk of buckling along an arbitrary path which would reduce the load bearing capacity and/or compression value. A further benefit of the presence of these sets of creases and/or folding lines is that, because the flaps and/or parts of the flaps are positioned angled with respect to each other, the reinforced corner protrudes out of the corner of the container, so that the surface area responsible for the load bearing capacity is enlarged. This way the pressure, being proportional to the stacking load and inversely proportional to the surface seen from above of the reinforced corner on which the force acts, is reduced and a larger maximum stacking load is obtained.

[0017] Furthermore, the angled positioning of the different parts of the corner construction gives the parts constituting the reinforced corner a certain freedom of mobility. The latter assures that the reinforced corners on one hand can support a larger stacking load, and on the other hand are free enough in their mobility to allow an easier collapsing of the container. The flexibility of mobility of the reinforcing piece further reduces the risk of buckling of the reinforcing piece itself as the more mobile it is, the less tension is developed on the reinforcing piece, positioned in the corner construction by the different parts of the corner construction when the container is erected.

[0018] Preferably the first diagonal folding line is provided in the side walls of the first pair.

[0019] The pressure to which the corners of the box-shaped container are subjected when stacked upon each other, can be further reduced by further increasing the surface on which a container positioned on top of another container rests. Thereto another preferred embodiment of the box-shaped container is characterised in that a top rim of the side walls of the second pair is connected to a widening strip having a length and a width, along a sixth folding line, the widening strips having nearly the same length as the side wall to which they are connected, the widening strips each comprising a pair of second diago-

nal folding lines which extend from corners on opposite sides of the widening strip at the position of the sixth folding line towards an edge of the widening strip opposing the sixth folding line, opposite transverse sides of each widening strip being connected to a retaining flap along respectively a seventh and eight folding line, the retaining flaps having a length that does not exceed the height of the side wall comprising the widening strip, each retaining flap further being fastened to a side wall adjacent to the side wall providing the widening strip, thus forming a supporting bridge. In this embodiment of the supporting bridge the benefit of dividing the stacking load and/or compression value over a larger surface is further applied. The retaining flaps of the widening strip further increase the maximum stacking load by additionally reinforcing the reinforced corner. Furthermore, when a force, due to the stacking load, is exerted on the widening flaps forming a bridge, the force is conducted outward by the diagonal folding lines originating from the corners of the widening strip with an upper edge of a side wall, thus pushing the walls of the container to the outside of the container, and opening the container, so as to mechanically prevent an eventual collapse of the container.

[0020] Preferably at least one flap of the reinforcing piece and the part of the side wall or the lengthening flap positioned along each other comprise positioning means to permit correct positioning of the reinforcing piece in the corner construction, which benefits the compression value, of the container.

[0021] The present invention also relates to a blank for the above described collapsible box-shaped container. A first embodiment of the blank comprises a substantially rectangular shaped bottom, a first pair of side walls positioned on a first pair of opposite sides of the bottom and a second pair of side walls positioned on a second pair of opposite sides of the bottom, provided to connect the side walls of the first pair, a diagonal folding line extending upwardly from both opposite bottom corners of each side wall of the first pair towards an upper edge of the first pair of side walls, and means for connecting comprising

(a) a lengthening flap, which extends from an upright side of a side wall along a first upright folding line,
(b) a connection flap, which extends from an upright side of the lengthening flap along a second upright folding line on a side opposite the first folding line,
(c) a fastening flap which extends from the connection flap along a third upright folding line, on a side of the connection flap opposite the second folding line.

This first embodiment of the blank is characterised in that a panel for a reinforcing piece comprising a first flap and a second flap connected to the first flap along a fourth folding line, is provided as a separate part.

[0022] A second preferred embodiment of the blank of the container of the present invention comprises a substantially rectangular shaped bottom, a first pair of side walls positioned on a first pair of opposite sides of the bottom and a second pair of side walls positioned on a second pair of opposite sides of the bottom, provided to connect the side walls of the first pair, a diagonal folding line extending upwardly from both opposite bottom corners of each side wall of the first pair towards an upper edge of the first pair of side walls, and means for connecting comprising

(a) a lengthening flap, which extends from an upright side of a side wall along a first upright folding line,
(b) a connection flap, which extends from an upright side of the lengthening flap along a second upright folding line on a side opposite the first folding line,
(c) a fastening flap which extends from the connection flap along a third upright folding line, on a side of the connection flap opposite the second folding line.

This embodiment of the blank is characterised in that it further comprises a first flap and a second flap, the first flap being connected to the second flap along a fourth folding line, the first flap being connected to the fastening flap along a fifth folding line on a side of the fastening flap opposite the third folding line.

[0023] Other details and advantages of the collapsible box-shaped container according to the invention will become apparent from the enclosed figures and description of preferred embodiments of the invention.

[0024] Figure 1 is a top view of a preferred embodiment of a blank of the invention for a collapsible box-shaped container, in which the reinforcing piece is made in one part with the blank.

[0025] Figure 2 is a top view of another preferred embodiment of a blank according to the invention for manufacturing a collapsible box-shaped container, in which the reinforcing piece is made in one part with the blank.

[0026] Figure 3a is a top view to a corner construction of a preferred embodiment of the collapsible box-shaped container of the invention, manufactured from the blank shown in figure 1.

[0027] Figure 3b is a perspective view to the corner construction shown in figure 3a.

[0028] Figure 4a is a top view to a corner construction of a preferred embodiment of the collapsible box-shaped container of the invention, manufactured from the blank shown in figure 2.

[0029] Figure 4b is a perspective view to the corner construction shown in figure 4a.

[0030] Figure 5 shows a preferred embodiment of a blank according to the invention, in which the reinforcing piece is made as a separate part.

[0031] Figure 6 shows another preferred embodiment of the blank according to the invention in which the reinforcing piece is made as a separate part.

[0032] Figure 7 is a top view to a corner construction of a preferred embodiment of the collapsible box-shaped container of the invention, manufactured from the blank

shown in figure 5.

[0033] Figure 8a is a top view to a corner construction of a preferred embodiment of the collapsible box-shaped container of the invention, manufactured from the blank shown in figure 6.

[0034] Figure 8b is a perspective view to the corner construction shown in figure 8a.

[0035] The box-shaped container of the present invention, part of which is shown in figures 3a, 3b, 4a, 4b, 7, 8a and 8b comprises a substantially rectangular bottom wall 2. However, the bottom wall may be square as well. The box-shaped container also comprises a first pair of side walls 6, connected to and folded in upright position with respect to the bottom wall 2 along folding lines 7, on opposite sides of the bottom wall 2. The box-shaped container further comprises a second pair of side walls 4, connected to and folded in upright position with respect to the bottom wall along folding lines 5 on opposite sides of the bottom wall 2. The bottom wall 2 and side walls 4, 6 enclose a central storage volume. In the embodiment shown the first pair of side walls 6 corresponds tot the longitudinal side walls of the container, the second pair 4 corresponds to the transverse side walls of the container, folding lines 7 correspond to longitudinal folding lines, folding lines 5 correspond to transverse folding lines.

[0036] As is shown in figure 4a, 4b, 8a and 8b a side wall of the second pair 4 of transverse side walls is connected to an adjacent longitudinal side wall of the first pair 6 by means of a corner construction. The corner construction comprises

- a lengthening flap 20, which extends from an upright side 8 of a side wall of the second pair 4 of transverse side walls along a first upright folding line 3,
- a connection flap 42, which extends from an upright side of the lengthening flap 20 along a second upright folding line 31 on a side of the lengthening flap opposite the first folding line 3, and is double-folded on the lengthening flap 20,
- a fastening flap 43 which extends from the connection flap 42 along a third upright folding line 33, on a side of the connection flap 42 opposite the second folding line 31.

Each container comprises four of such corner constructions, along each upright side 8 of the side walls of the second pair 4.

[0037] According to another preferred embodiment show in figures 3a, 3b, 7 it is also possible to connect the above-described corner construction to a side wall of the first pair 6 of longitudinal side walls which contain the first diagonal folding lines 39 ensuring the collapsibility of the container. In that case the corner construction comprises a lengthening flap 20, which extends from an upright side 46 of a longitudinal side wall of the first pair 6 along upright folding line 53. This corner construction further comprises a connection flap 42 and a fastening flap 43 as described above. Also in this case, each container comprises four of such corner constructions, along each upright side 46 of the side walls of the first pair 6.

[0038] Preferably, each connection flap 42 comprises an upwardly extending crease 32 dividing the connection flap 42 in a first part 21 distal from the fastening flap 43 and a second part 22 proximal to the fastening flap 43 (see fig. 3a, 3b, 4a, 4b, 7, 8a, 8b). Also preferably each fastening flap 43 comprises a first upwardly extending crease 34, dividing the fastening flap 43 in a first 23 and a second part 24. The fastening flap 43 may however comprises a second upwardly extending crease 45, thus dividing the fastening flap 43 in a first part 23 proximal to the connection flap 42, a second central part 24, and a third part 44 distal from the connection flap 42 (see figure 7, 8a, 8b).

[0039] The first and second part 21, 22 of the connection flap 42 are preferably positioned angled with respect to each other. Similarly, the first 23, second 24 and third 44 part of the fastening flap 43 are also positioned angled with respect to each other. In that way, part of the fastening 43 and connection 42 flaps extend into the inner storage volume of the box-shaped container and an enlarged corner support area is provided, thus creating a larger support surface for a container stacked upon it (see figures 3, 4, 7, 8). Thereby the angle will mostly be chosen such that optimum support is provided, while minimising the loss of storage volume. The exact position of the parts of the different flaps and the angle between them may be varied by the person skilled in the art according to the nature of the material used and the desired compression value and/or load bearing capability.

[0040] The dimensions of the lengthening 20, connection 42 and fastening flaps 43 are not critical to the invention. However, to maximise the compression value of the corner construction, these flaps are preferably mainly rectangular and have a length which is chosen such that they rest on the bottom wall 2 in the upright position of the container. Thereto, the length of the flaps preferably virtually corresponds to, but is somewhat smaller than the height of the corresponding side wall 4, 6 at the position of the bottom wall 2. The width of the flaps will usually be chosen such that an optimum compromise is achieved between increasing the load bearing capacity and compression value of the corner construction, and the sturdiness of the corner, which reduces the possibility of the container to absorb load by its flexibility, thus increasing the risk to buckle.

[0041] The container can be made of massive cardboard, corrugated board, sheet plastic or corrugated plastic or any other material known to the person skilled in the art.

[0042] The corner construction of the present invention further comprises a reinforcing piece 59. The reinforcing piece 59 comprises a first flap 25 and a second flap 26, which are connected to each other along a fourth upright folding line 36. The reinforcing piece may be made in one piece with the corner construction as is shown in figure

3a, 3b, 4a, 4b, or may be made as a separate part as is shown in figure 7, 8a and 8b. In case the reinforcing flap is made in one piece with the corner construction, production is less time consuming. In that case, the first flap 25 is connected to the fastening flap 43 along a fifth folding line 35, on a side of the fastening flap 43 opposite the third folding line 33. The second flap 26 is connected to the first flap 25 along a fourth folding line 36, on a side of the second flap opposite the fifth folding line 35.

[0043] In case the reinforcing piece 59 is made as a separate part it is preferred that, at least one of the first and second flap 25, 26 comprise positioning means 47, which are provided to co-operate with corresponding positioning means 48 on the side walls of the first or second pair 6, 4 or the lengthening flap 20, or any other of the flaps. Preferably the positioning means 48 are provided on the part of the box-shaped container to which the reinforcing piece 59 has to be fastened, as depicted in figures 5, 6, 7 and 8a and 8b. The positioning means may be any positioning means considered suitable by the person skilled in the art. In view of simplifying construction and positioning, the positioning means preferably comprise at least one centering hole in at least one of the first and second flap 25, 26 and a corresponding centering hole on the part of the box-shaped container to which the reinforcing piece 59 is to be fastened, the two centering holes 47, 48 coinciding in the correct position of the reinforcing piece 59. A correct positioning of the reinforcing piece while being manufactured maintains an optimum flexibility and collapsibility in addition to providing the required load bearing capacity and/or compression value.

[0044] In order to allow the container to be collapsible, a diagonal folding line 39 extends from both bottom corners 16 of the first pair of side walls 6 towards the outer edge 10. The angle of the diagonal folding line 39 can be determined by the person skilled in the art depending on the dimensions of the container. It is however preferred that the diagonal folding line 39 is provided on the side wall adjacent the side wall connected to the lengthening flap 20 along folding line 3 as in this case folding of the container from the blank appears to be most simple.

[0045] To guarantee that the container is collapsible, the lengthening flap 20 or any other flap 25, 44 of the corner construction being fastened to an adjacent wall comprising the diagonal folding line 39, is fastened to the part 19 of the side wall delimited by diagonal folding line 39, upper edge 10 and upright edge 46 of the side wall.

[0046] As can be seen from figures 4a, 4b, 8a, 8b the part of the outer face 49 of the lengthening flap 20 is fastened to the part 19 of the surface of the inner face 51 of the adjacent longitudinal side wall 6 of the first pair of side walls, facing the inner storage volume located between the diagonal folding line 39 and the upper edge 10 of the side wall 6. In the embodiment of figures 3a, 3b, 7, the lengthening flap 20 is fastened with at least part of its outer face 49 to the part of the surface of the inner face 50 of the adjacent transverse side wall 4 of the second pair of side walls, facing the inner storage volume.

[0047] If so desired, the connection flap 42 may be fastened with at least part of the surface of its outer face 54 to part of the surface of the inner face 55 of the lengthening flap 20. However, as can be seen from figure 4a, the fastening may be dispensed with. The first part 21 of the connection flap 42 distal from the fastening flap 43 is fastened to the lengthening flap 20 to provide sufficient moveability of all parts of the corner construction.

[0048] In the embodiment where the reinforcing piece 59 is made in one part with the remainder of the blank of the container (fig. 3a, 3b, 4a, 4b), the fastening flap 43 is fastened with at least part of the surface of its outer face 56 to the inner face of the first flap 25 of the reinforcing piece 59, in case the reinforcing piece 59 extends from the second pair of transverse side walls 4, not containing the diagonal folding lines 39; or is not fastened to a side wall, in case the reinforcing piece 59 extends from the first pair of longitudinal side walls 6, containing the diagonal folding lines 39. To improve the flexibility and collapsibility of the container, preferably only the second part 24 distal from the connection flap 42 is fastened.

[0049] In the embodiment where the reinforcing piece 59 is made in one part with the remainder of the blank of the container (fig. 3a, 3b, 4a, 4b), the first flap 25 of the reinforcing piece 59 is positioned between the fastening flap 43 and the side wall to which the lengthening flap 20 is connected. In that case at least part of the surface of the outer face of the first flap 25 will be fastened to the inner surface 50, 51 of the side wall 4, 6 providing the lengthening flap 20.

[0050] In the embodiment where the reinforcing piece 59 is made as a separate part (fig. 7, 8a, 8b) preferably only the third part 44 of the fastening flap 43 distal from the connection flap 42 is fastened to part of an inner face 51, 50 of either the first or second pair of side walls 6, 4. In that embodiment, either at least part of the first or second flap 25, 26 may be fastened to the inner face 51, 55 of the side wall 6, 4 providing the lengthening flap 20 or inner face 55 of the lengthening flap 20 respectively.

[0051] Generally, in fastening the different flaps of the container the person skilled in the art will choose the optimum between on one hand fastening as much as possible thus providing the corner with a larger overall strength, load bearing capacity and/or compression value and decreasing the risk for the container to collapse and on the other hand fastening as little as possible decreasing the tension in the corner of the container thus decreasing the risk for the reinforcing piece to buckle.

[0052] The shape of the reinforcing piece 59 is not critical to the invention but is preferably rectangular. To obtain optimum reinforcement, the length of the reinforcing piece 59 in height direction of the container preferably corresponds to the height of the upright edge 8, 46 of the side walls 4, 6.

[0053] In case the reinforcing piece 59 is made as a separate part, it can be made of the same material as the remainder of the container or of a different material.

The reinforcing piece 59 can be made of any material found suitable by the person skilled in the art and can be adapted to the envisaged properties, expected bearing capacity, load to which the corners are to be subjected and compression value. By suitably selecting the material for the reinforcing piece 59, its properties may be adapted independently of the remainder of the container. Similarly to the container, the reinforcing piece 59 can be made of massive cardboard, corrugated board, sheet plastic or corrugated plastic or any other material known to the person skilled in the art.

[0054] The width of the flaps 25, 26 of the reinforcing piece 59 is not critical to the invention and may be adapted by the person skilled in the art dependent on the amount of space left open in the corner construction when the container is collapsed and the envisaged reinforcement.

[0055] The inventors have found that due to the presence of the above described reinforcing piece 59 comprising a first and a second flap 25, 26 the load bearing capacity and compression value of the container may be significantly increased. Although additional flaps are positioned in the corner area, the storage volume of the container is not significantly affected, the flexibility of the container remains sufficiently high to permit it absorbing at least part of a load positioned on top of it and to ensure that the collapsibility of the container is not endangered.

[0056] A container according to this invention with a reinforcing piece connected to the fastening flap along the fifth folding line and being made of cardboard of a quality of 850 gr/m^2 has a compression value of 3,12kN, a container with a separate reinforcing piece, the reinforcing piece being made of cardboard of 750gr/m^2 and the rest of the container being made of cardboard of 850 gr/m^2, has a compression value of 2,95kN while a container made according to EP-B-0.621.192 using cardboard of 1050gr/m^2 only has a compression value of 2,70kN.

[0057] To further enlarge the support surface, preferably a widening strip 28 is connected to a top rim 10, 9 of the first pair 6 or second pair 4 of opposing side walls respectively. The shape of the widening strip 28 is not critical to the invention and in the preferred embodiment is chosen to be rectangular. Its longitudinal side is positioned along a sixth folding line 18, 58 with the side wall to which it is connected. The longitudinal side of the widening strip 28 preferably nearly has the same length as the top rim 10, 9 of the respective side wall, thus giving a maximum of support to any container positioned on top of it. The widening strips 28 comprise diagonal folding lines 37 extending from each of the corners along the sixth folding line 18, 58. When the widening strips 28 are connected to the side walls of the first pair 6, the diagonal folding lines 39 extend linearly over the widening strip, thus forming a second pair of folding lines 38. Both pairs of folding lines 37, 38 allow the container to be collapsible and their exact position can be determined by the person skilled in the art. On opposite transverse sides of each of the widening strips a retaining flap 27 is connected along a seventh and an eight folding line 30 respectively. The retaining flap 27 is fastened to the reinforced corner during manufacturing the collapsible box-shaped container, thus further reinforcing the already reinforced corner. Thus positioning the retaining flaps 27 of course restricts the length of the retaining flaps 27 to the length of the upright edges 46 of the container. The exact position of the retaining flaps after being fastened is not critical to the invention.

[0058] The container can be further strengthened by providing reinforcing flaps 29, which are connected along a pair of opposing side walls not comprising a widening strip 28, preferably the side walls of the first pair 6. The reinforcing flaps 29 are double-folded and fastened on an inner side of that pair of side walls. The reinforcing flap 29 can have any shape found suitable by the person skilled in the art. The reinforcing flaps 29 may comprise two additional folding lines 40 which overlap the diagonal folding lines 39 thus ensuring that the container remains collapsible. Preferably the reinforcing flaps 29 are connected to the corresponding side walls by a folding line along the upper edge 10, 9 of the side wall so that the reinforcing flaps 29 are part of the same blank 1 for the container.

[0059] To minimise the risk to inward slipping of the side walls, following a load exerted to the side walls and/or the corners, preferably means for keeping the side walls in an upright position are added. In a first embodiment, when the lengthening flap 20 is connected to the side walls of the first pair 6 (figures 1, 3b, 5, 7) comprising the diagonal folding lines 39, part of the fastening flap 43, when the reinforcing piece 59 is not connected to the fastening flap 43 is widened in the direction of the bottom 2. If the reinforcing piece 59 is connected to the fastening flap 43 along the fifth folding line 35, the fifth folding line 35 and part of the fastening flap 43 and/or the first flap 25 of the reinforcing piece 59 adjacent to the fifth folding line 35, are widened in the direction of the bottom 2. The widening in both cases thus forming a slip lip 12. In a second preferred embodiment, when the lengthening flap 20 is connected to side walls of the second pair 4 (figures 2, 4b, 6, 8b), according to the invention the second folding line 31 and part of the lengthening flap 20 and/or the connection flap 42 adjacent to the fold 31 are widened in the direction of the bottom 2, thus forming a slip lip 12. The length of the slip lip 12 is measured from the nearest edge to the bottom 2 of lengthening flap 20 and connection flap 42, the fastening flap 43 or the first flap 25 of the reinforcing piece and fastening flap 43 to the bottom edge of the slip lip 12, and is chosen to be greater than the distance between the bottom 2 of the container and the nearest edge to the bottom 2 of lengthening flap 20 and connection flap 42, fastening flap 43 or the first flap 25 from the reinforcing piece and the fastening flap 43 respectively. The slip lip 12 causes friction by pressing on the bottom 2 of the container when unfolding the container and when the container is erected,

as a result of which the side walls can be kept in an upright position. By using a double slip lip 12, the risk to buckling is decreased. When using a single slip lip 12, next to using less material, the slip lip 12 is more flexible and may be more easily bent when erecting the container.

[0060] The slip lip 12 is provided to be received in a corresponding cut 13, when erected, which extends along the bottom folding line 7 between the side wall 6 comprising the diagonal folding lines 39 and the bottom wall 2. This further reduces the risk of an unwanted collapse of the container. A cut 11 is provided in the folding line 5 extending between the side wall of the second pair 4 and the bottom 2 for receiving the slip lip 12 when the container is collapsed.

[0061] Preferably the box-shaped container comprises positioning means which permit to stack two containers on top of each other in a well defined position. As can be seen from figure 1, 2, 5, 6 the positioning means comprise protruding edges 14, created by widening at least one flap of the reinforced corner in a direction pointing away from the bottom 2, so that the protruding edges 14 of a box-shaped container can be received in corresponding cuts 11 left out in the bottom wall 2 of a second container positioned on top of it. In a first preferred embodiment according to the invention, when the lengthening flap 20 is connected to the side walls of the first pair 6 (figures 1, 5) comprising the diagonal folding lines 39, part of the lengthening flap 20 and/or part of the connection flap 42 are widened along the second folding line 31. In a second preferred embodiment according to the invention, when the lengthening flap 20 is connected to side walls of the second pair 4 (figures 2, 6), part of the fastening flap 43 and/or part of the first flap 25 of the reinforcing piece 59 can be widened along the fifth folding line 35, in case the reinforcing piece is connected to the fastening flap 43 along the fifth folding line 35, or the fastening flap 43 can be widened if the reinforcing piece isn't connected to the fastening flap 43. In case the flaps comprising the protruding edges 14 are positioned along a side wall comprising a supporting bridge 28 when the container is erected or being erected, the protruding edge 14 is received in an opening 17 in the widening strip 28 and can be received in a corresponding cut 11 in the bottom wall 2, along the bottom folding line 7 of a container placed on top of it. The protruding edges 14 and corresponding cuts 11 permit stacking the containers in a uniform way, thus improving the stability of a stack of containers. The more or less exact positioning of the containers also causes a better and more uniformly divided pressure over the reinforcing means discussed above, thus further enlarging the maximum stacking load possible.

[0062] Either one or both pairs of side walls may comprise a cut 15 large enough to allow passing of a human hand. This way a better handling of the filled container can be realised.

[0063] Fastening of parts to each other may be achieved by any fastening means known to the person skilled in the art, for example stapling, gluing, although gluing is preferred.

[0064] The blank 1 for the box-shaped container according to the invention comprises a substantially rectangular shaped bottom 2, a first pair of side walls 6 positioned on a first pair of opposite sides of the bottom 2 and connected thereto along a first pair of folding lines 7 and a second pair of side walls 4 positioned on a second pair of opposite sides 5 of the bottom 2 and connected thereto along a second pair 5 of folding lines, a diagonal folding line 39 extending upwardly from both opposite bottom corners 16 of each side wall of the first pair 6 towards the upper edge 10, the diagonal folding line 39 allowing the box-shaped container to be collapsible. The blank 1 further comprises means for connecting adjacent side walls of the first and second pair, in particular:

(a) a lengthening flap 20, which extends from an upright side 46, 8 of a side wall 6, 4 along a first upright folding line 53, 3.

(b) a connection flap 42, which extends from an upright side 31 of the lengthening flap 20 along a second upright folding line 31 on a side opposite the first folding line 53, 3.

(c) a fastening flap 43 which extends from the connection flap 42 along a third upright folding line 33, on a side of the connection flap 42 opposite the second folding line 31.

[0065] The blank 1 of the present invention can be made as one single piece as is shown in figure 1 and 2, in which the first flap 25 of the reinforcing piece 59 is connected to the fastening flap 43 along the fifth folding line 35, or in parts as is shown in figure 5 and 6, in which the reinforcing piece is not connected to the blank 1 and is made as a separate part.

[0066] The blank 1 can be made of any material found suitable by the person skilled in the art, for example: cardboard, corrugated board, corrugated plastic or any other material known to the person skilled in the art. All the possible materials can come in different forms of quality, durability and prices. The container can thus be crafted by the person skilled in the art according to the specific properties wanted.

Claims

1. A collapsible box-shaped container comprising a substantially rectangular shaped bottom (2), a first pair of upright side walls (6) positioned on a first pair of opposite sides (7) of the bottom (2) and a second pair of upright side walls (4) positioned on a second pair of opposite sides (5) of the bottom (2) connecting the side walls of the first pair (6), which together define an inner storage volume of the container, a first diagonal folding line (39) extending upwardly from both opposite bottom corners (16) of each side wall

of the first pair (6) towards an upper edge (10) of the first pair of side walls (6), the diagonal folding line (39) allowing the box-shaped container to be collapsible, adjacent side walls of the first (6) and second pair (4) being attached to each other by a corner construction, the corner construction comprising

(a) a lengthening flap (20), which extends from an upright side (46,8) of a side wall (6,4) along a first upright folding line (53,3) and is fastened with at least part of an outer face (49) to part of an inner face (50,51) of an adjacent side wall (4,6) facing the inner storage volume,
(b) a connection flap (42), which extends from an upright side (31) of the lengthening flap (20) along a second upright folding line (31) on a side opposite the first folding line (53,3), and is double-folded thereon, and
(c) a fastening flap (43) which extends from the connection flap (42) along a third upright folding line (33), on a side of the connection flap (42) opposite the second folding line (31) and is positioned along the side wall (6,4) providing the lengthening flap (20),

characterised in that, the corner construction further comprises a reinforcing piece (59) comprising a first flap (25) extending along the side wall (6,4) providing the lengthening flap (20) and a second flap (26) extending along the lengthening flap (20), the first and second flap being connected to each other along a fourth upright folding line (36).

2. A collapsible box-shaped container according to claim 1, **characterised in that** the first flap (25) of the reinforcing piece (59) is positioned between the fastening flap (43) and the side wall (6,4) providing the lengthening flap (20), **in that** the second flap (26) of the reinforcing piece (59) is positioned between the lengthening flap (20) and the connection flap (42) and **in that** the fourth folding line (36) is positioned on a diagonal line of the bottom (2) connecting opposite diagonal corners (16).

3. A collapsible box-shaped container according to claim 1 or 2, **characterised in that** the first flap (25) is fastened with at least part of an outer face (52) to an inner face (51,50) of the side wall (6,4) providing the lengthening flap (20) facing the storage volume.

4. A collapsible box-shaped container according to any one of claims 1 - 3, **characterised in that** the second flap (26) is fastened with at least part of an outer face (57) to an inner face (55) of the lengthening flap (20) facing the storage volume.

5. A collapsible box-shaped container according to any one of claims 1 - 4, **characterised in that** the first flap (25) is connected to an upright side of the fastening flap (43) along a fifth folding line (35).

6. A collapsible box-shaped container according to any one of claims 1 - 5, **characterised in that** the connection flap (42) comprises at least one upwardly extending set of creases and/or folding lines (32) dividing the connection flap in at least a first part (21) distal from the fastening flap (43) and a second part (22) proximal to the fastening flap (43), the first (21) and second (22) part being positioned angled with respect to each other, thus providing an enlarged corner area which extends into the inner storage volume of the container.

7. A collapsible box-shaped container according to claim 6, **characterised in that** the distal part (21) of the connection flap (42) with relation to the fastening flap (43) is fastened with at least part of its surface to the lengthening flap (20) and/or the second flap (26) of the reinforcing piece (59).

8. A collapsible box-shaped container according to any one of claims 1 - 7, **characterised in that** the fastening flap (43) comprises at least one upwardly extending set of creases and/or folding lines (45,34) dividing the fastening flap (43) in at least a first part (23) proximal to the connection flap (42) and a second part (24) distal from the connection flap (42), the distal part (24) being fastened with at least part of its surface to the first flap (25) and/or the side wall (6,4) providing the lengthening flap (20), the first (23) and second part (24) being positioned angled with respect to each other, thus providing an enlarged corner area which extends into the inner storage volume of the container.

9. A collapsible box-shaped container according to any one of claims 1 - 8, **characterised in that** the first diagonal folding lines being provided in the first pair (4) of side walls and **in that** a top rim (10,9) of at least one pair of opposite upright side walls (6,4) is connected to a widening strip (28) having a length and a width, along a sixth folding line (58,18), the widening strips having the same length as the side wall (6,4) to which they are connected, the widening strips each comprising a pair of second diagonal folding lines (37) extending from corners on opposite sides of the widening strip (28) at the position of the sixth folding line (58,18) towards an edge of the widening strip opposing the sixth folding line, opposite transverse sides (30) of each widening strip (28) being connected to a retaining flap (27) along respectively a seventh and eight folding line (30), the retaining flaps (27) having a length that does not exceed the height of the side wall (6,4) comprising the widening strip (28), each retaining flap (27) further being fastened to an adjacent side wall (4,6) to the

side wall (6,4) providing the widening strip (28), thus forming a supporting bridge.

10. A collapsible box-shaped container according to any one of claims 1 - 9, **characterised in that** at least one pair of opposing side walls (4,6) each comprise a reinforcing flap (29), the reinforcing flaps (29) being connected along an upper edge (9,10) of the side walls (4,6) and being double-folded and fastened on an inner side of the side walls (4,6) facing the central storage volume to which they are connected, the flaps (29) having a length smaller than or equal to the length of the corresponding side walls (4,6) and a height smaller than or equal to the height of the side walls (4,6) to which they are connected.

11. A collapsible box-shaped container according to any one of claims 1 - 10, **characterised in that** at least one of the flaps of the corner construction and/or the reinforcing piece (59) is widened in direction of the bottom (2) over part of its width along a folding line with the bottom (2) thus forming a slip lip (12) the height of the slip lip (12) being greater than the distance between the bottom (2) of the box-shaped container and the nearest edge to the bottom (2) of the flap(s) from which it protrudes.

12. A collapsible box-shaped container according to claim 11, **characterised in that** the bottom (2) comprises a cut (13) along the connection between the side walls (6) of the first pair and the bottom (2) for receiving the slip lip (12) when the container is erected and another cut (11) along the connection between the side walls (4) of the first pair and the bottom (2) for receiving the slip lip (12) when the container is collapsed.

13. A collapsible box-shaped container according to any one of claims 1 - 12, **characterised in that** the lengthening flap (20) is provided on the second pair of transverse side walls (4).

14. A collapsible box-shaped container according to any one of claims 1 - 13, **characterised in that** at least one flap (25,26) of the reinforcing piece (59) and the part of the side wall (6,4) or the lengthening flap (20) positioned along each other comprise co-operating positioning means (47,48) to permit correct positioning the reinforcing piece (59) in the corner construction of the container.

15. A blank (1) for a collapsible box-shaped container according to any one of claims 1 - 4 and 6 - 14 comprising a substantially rectangular shaped bottom (2), a first pair of side walls (6) positioned on a first pair of opposite sides (7) of the bottom (2) and a second pair of side walls (4) positioned on a second pair of opposite sides (5) of the bottom (2), a first diagonal folding line (39) extending upwardly from both opposite bottom corners (16) of each side wall of the first pair (6) towards an upper edge (10) of the first pair of side walls (6), the diagonal folding line (39) allowing the box-shaped container to be collapsible, and means for connecting first (6) and second pair (4) to each comprising

(a) a lengthening flap (20), which extends from an upright side (46,8) of a side wall (6,4) along a first upright folding line (53,3),
(b) a connection flap (42), which extends from an upright side (31) of the lengthening flap (20) along a second upright folding line (31) on a side opposite the first folding line (53,3), and
(c) a fastening flap (43) which extends from the connection flap (42) along a third upright folding line (33), on a side of the connection flap (42) opposite the second folding line (31),

characterised in that, a panel for a reinforcing piece (59) comprising a first flap (25) and a second flap (26) connected to the first flap (25) along a fourth folding line (36), is provided as a separate part.

16. A blank for a collapsible box-shaped container according to any one of claim 1 - 14 comprising a substantially rectangular shaped bottom (2), a first pair of side walls (6) positioned on a first pair of opposite sides (7) of the bottom (2) and a second pair of side walls (4) positioned on a second pair of opposite sides (5) of the bottom (2), a first diagonal folding line (39) extending upwardly from both opposite bottom corners (16) of each side wall of the first pair (6) towards an upper edge (10) of the first pair of side walls (6), the diagonal folding line (39) allowing the box-shaped container to be collapsible, and means for connecting adjacent side walls of the first (6) and second pair (4) to each comprising

(a) a lengthening flap (20), which extends from an upright side (46,8) of a side wall (6,4) along a first upright folding line (53,3),
(b) a connection flap (42), which extends from an upright side (31) of the lengthening flap (20) along a second upright folding line (31) on a side opposite the first folding line (53,3),
(a) a fastening flap (43) which extends from the connection flap (42) along a third upright folding line (33), on a side of the connection flap (42) opposite the second folding line (31),

characterised in that, the blank comprises a panel for a reinforcing piece (59), the piece comprising a first flap (25) and a second flap (26), the first flap (25) being connected to the second flap (26) along a fourth folding line (36), the first flap (25) being connected to the fastening flap (43) along a fifth folding line (35).

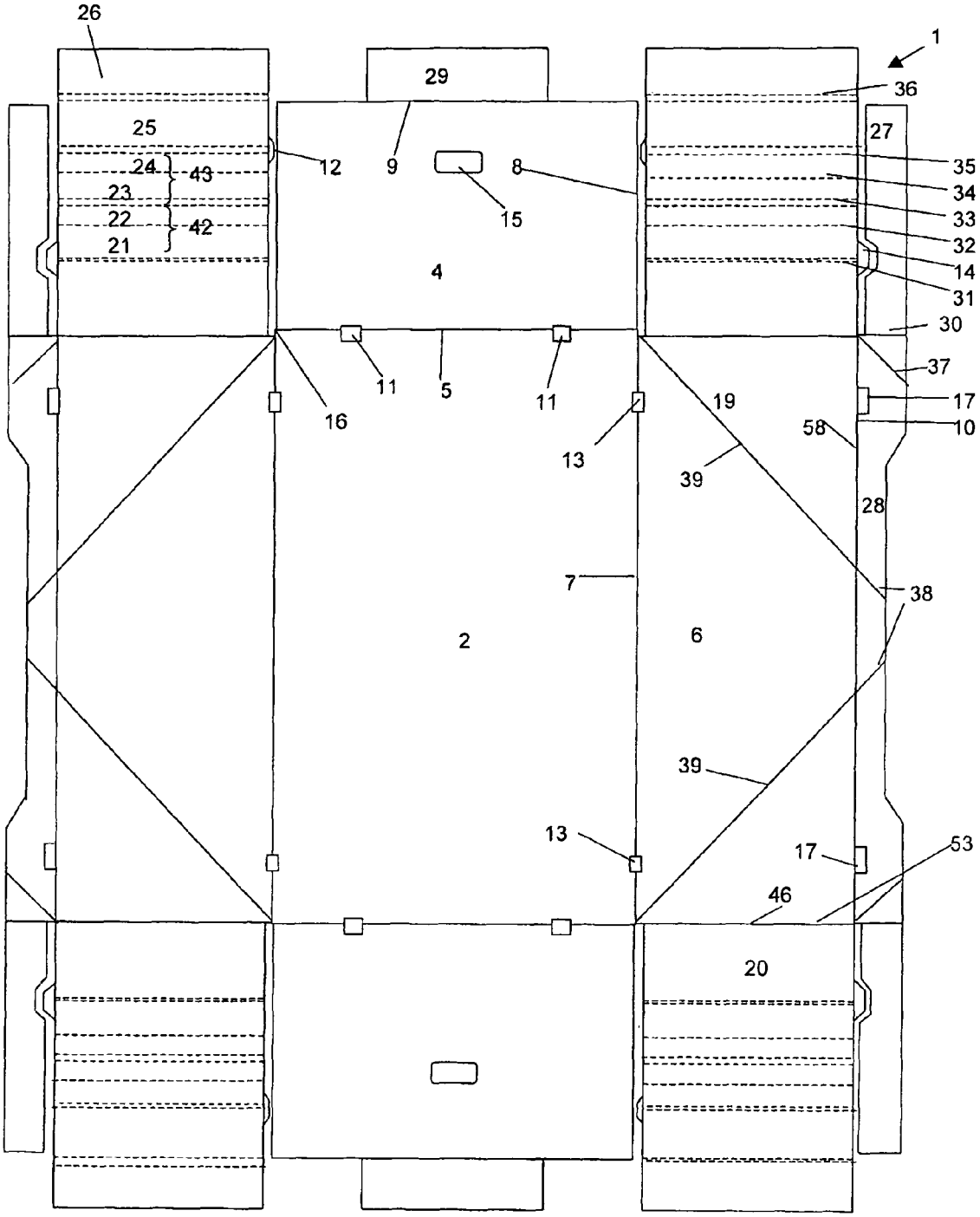
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Fig. 1

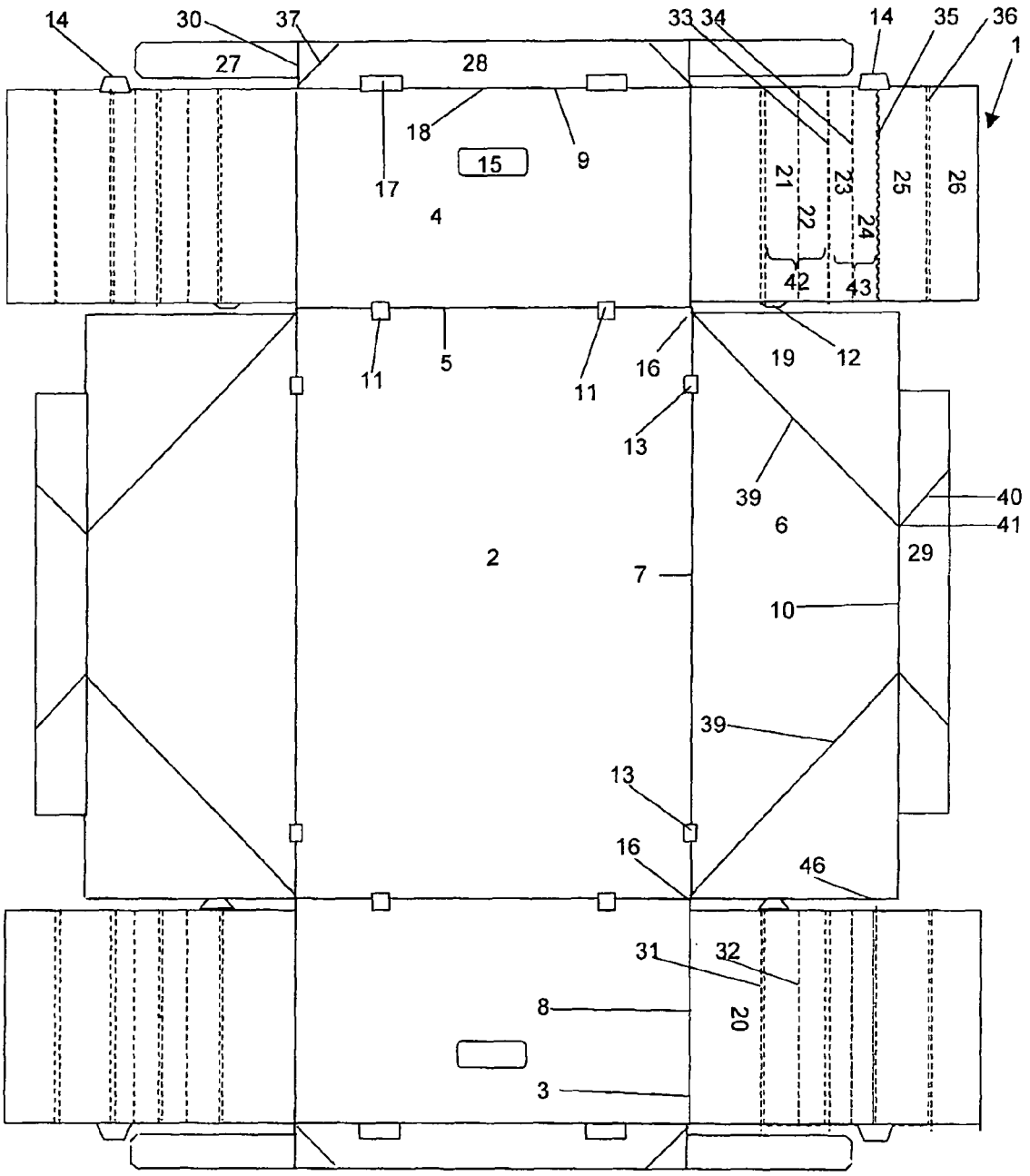
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Fig. 2

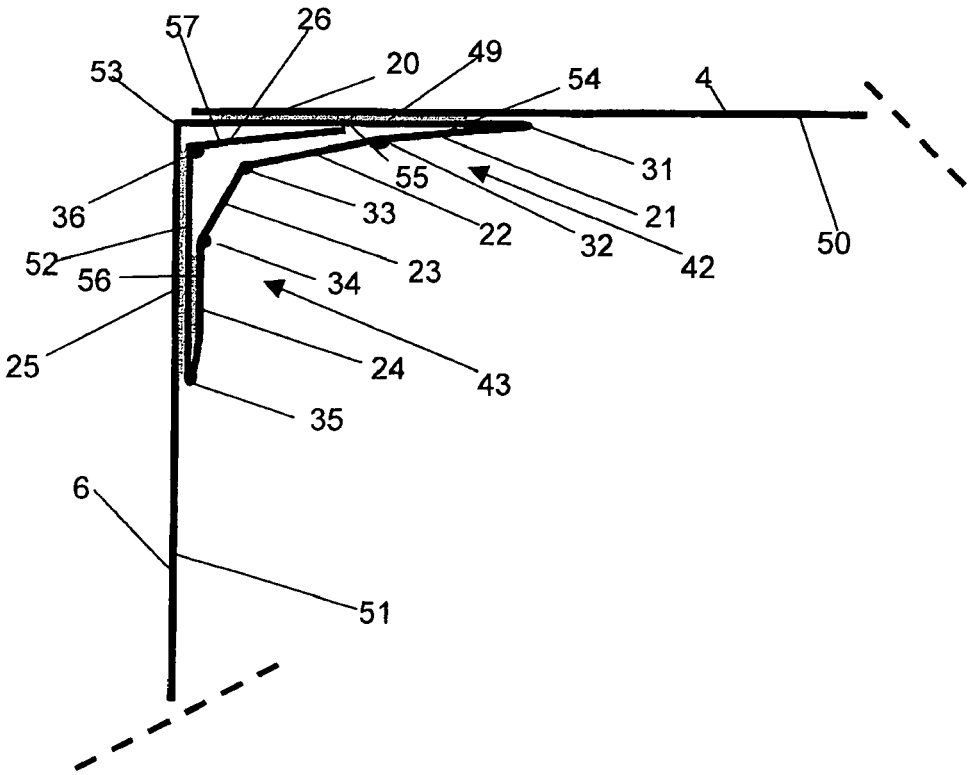
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Fig. 3A

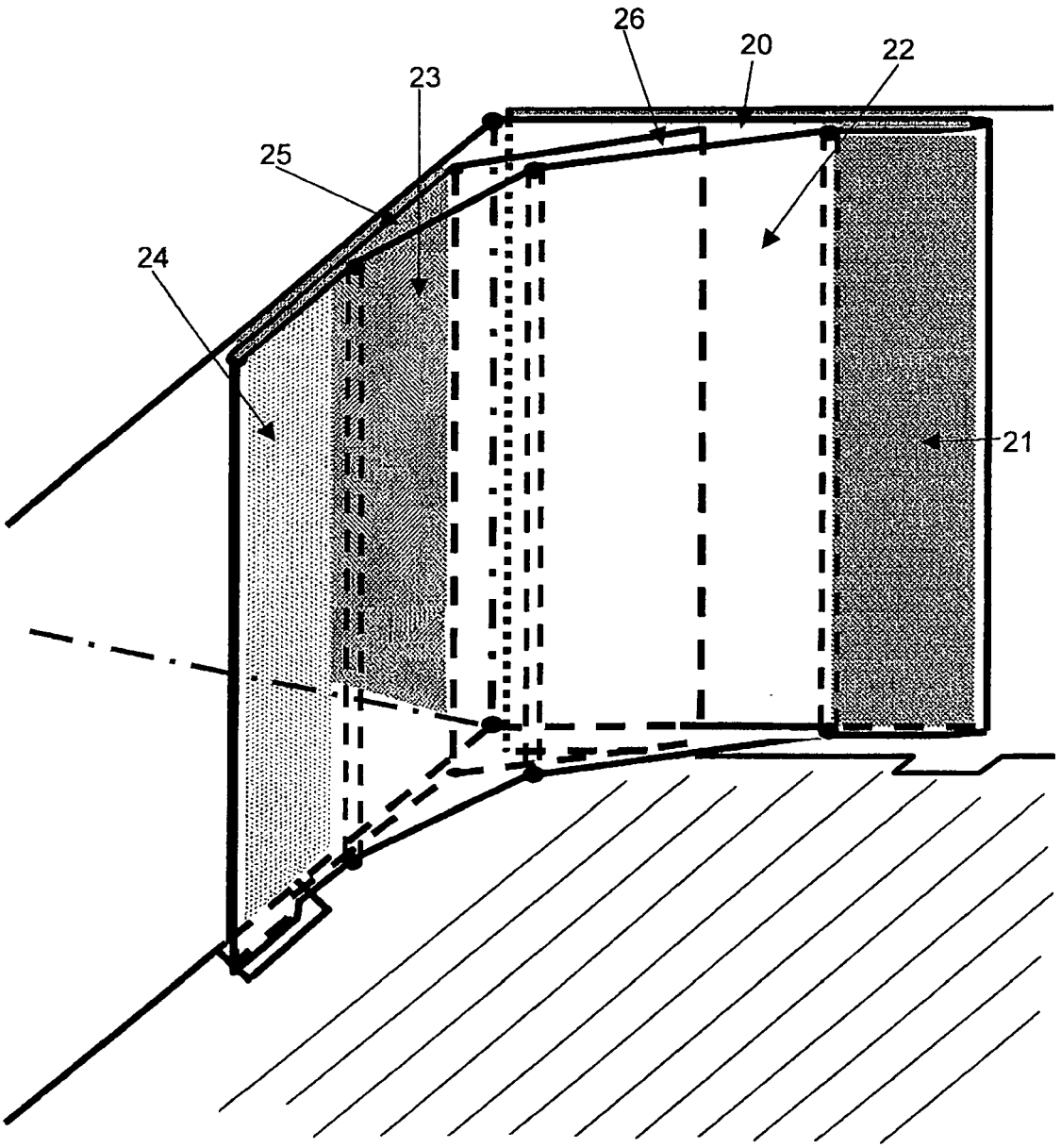

Fig. 3B

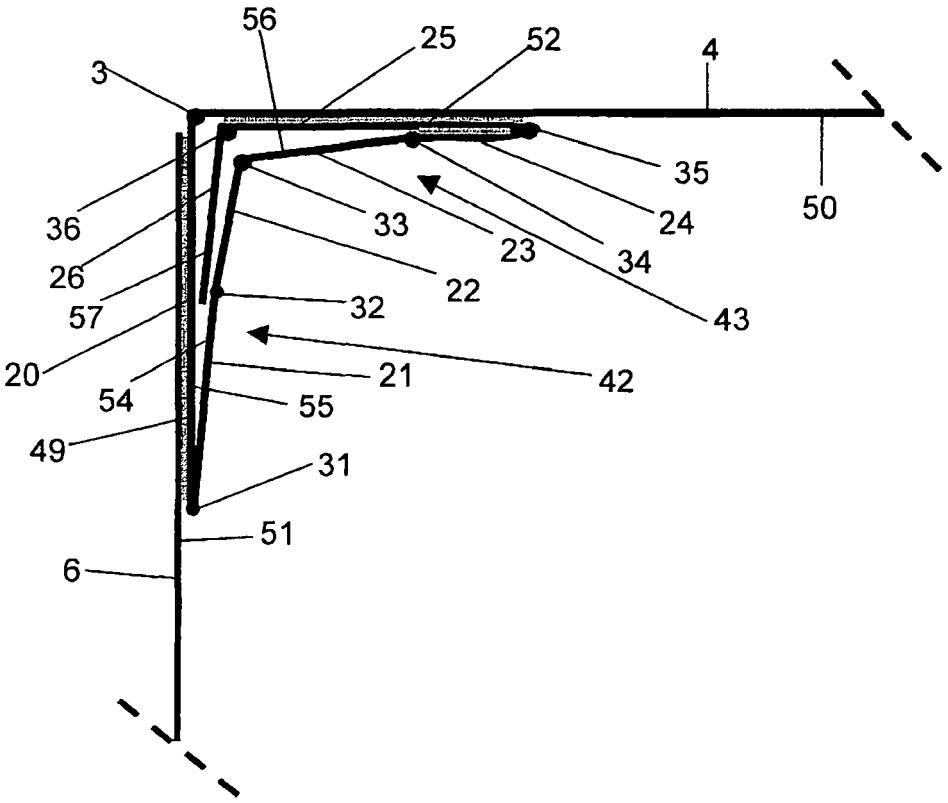

Fig. 4A

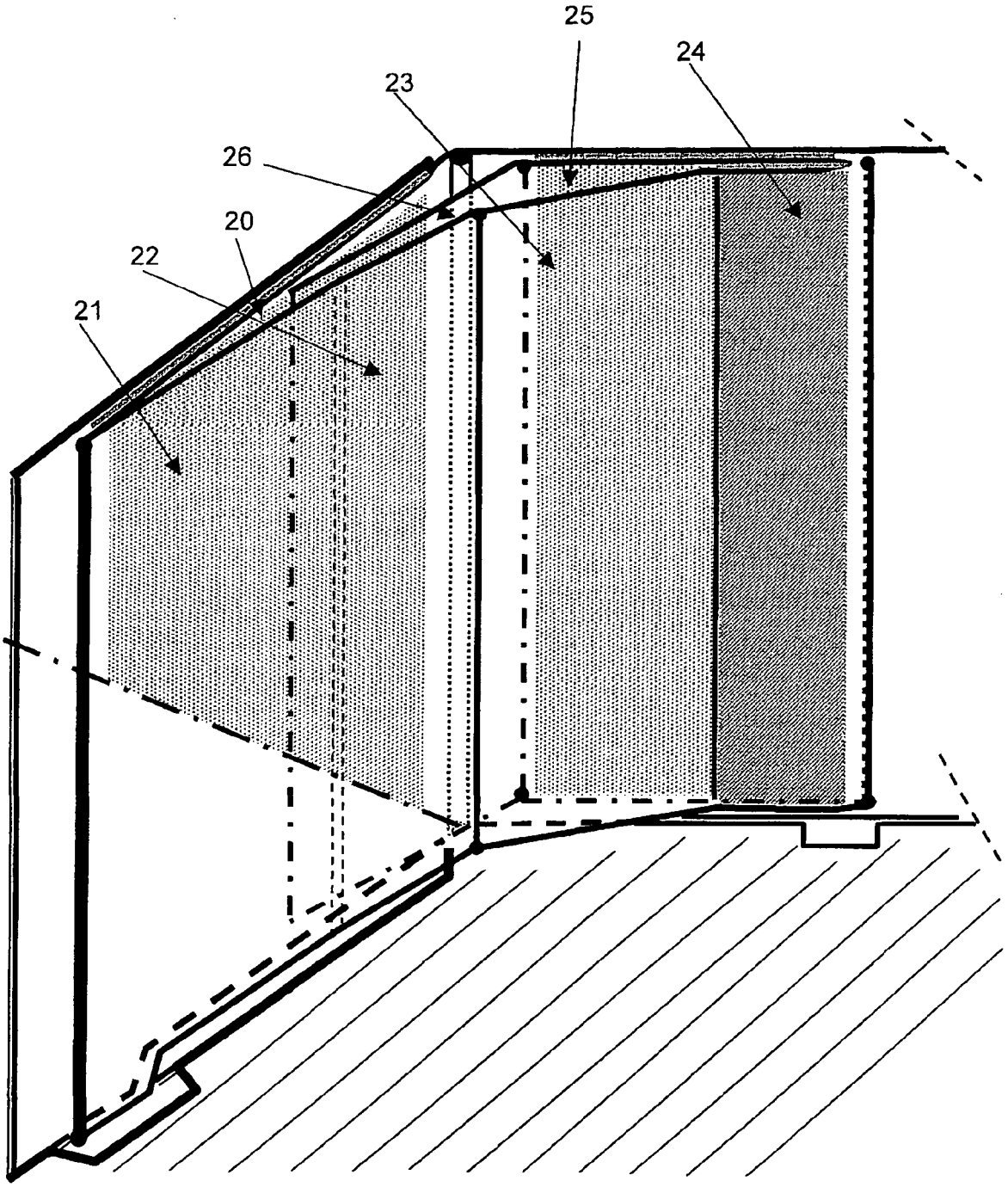

Fig. 4B

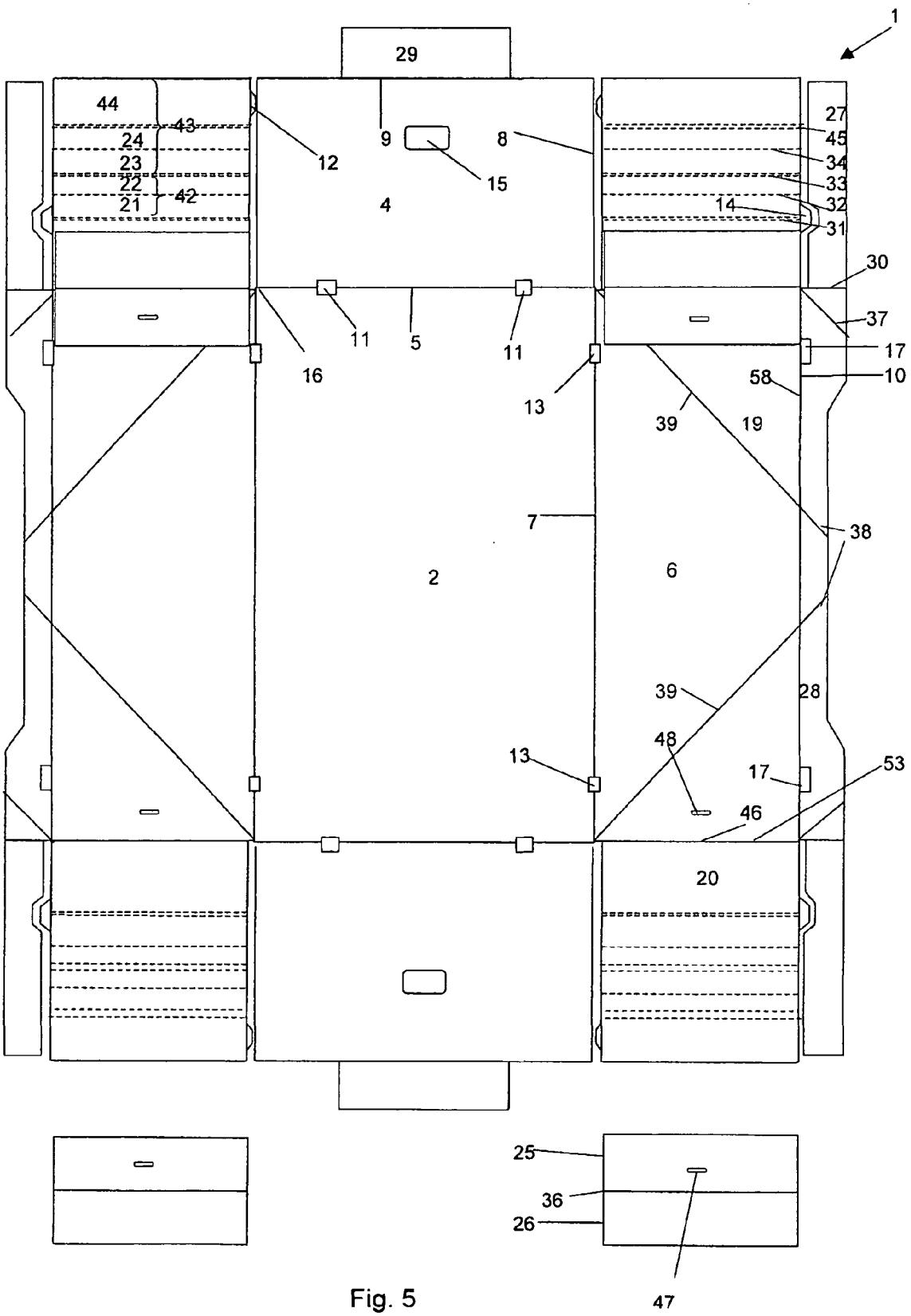
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Fig. 5

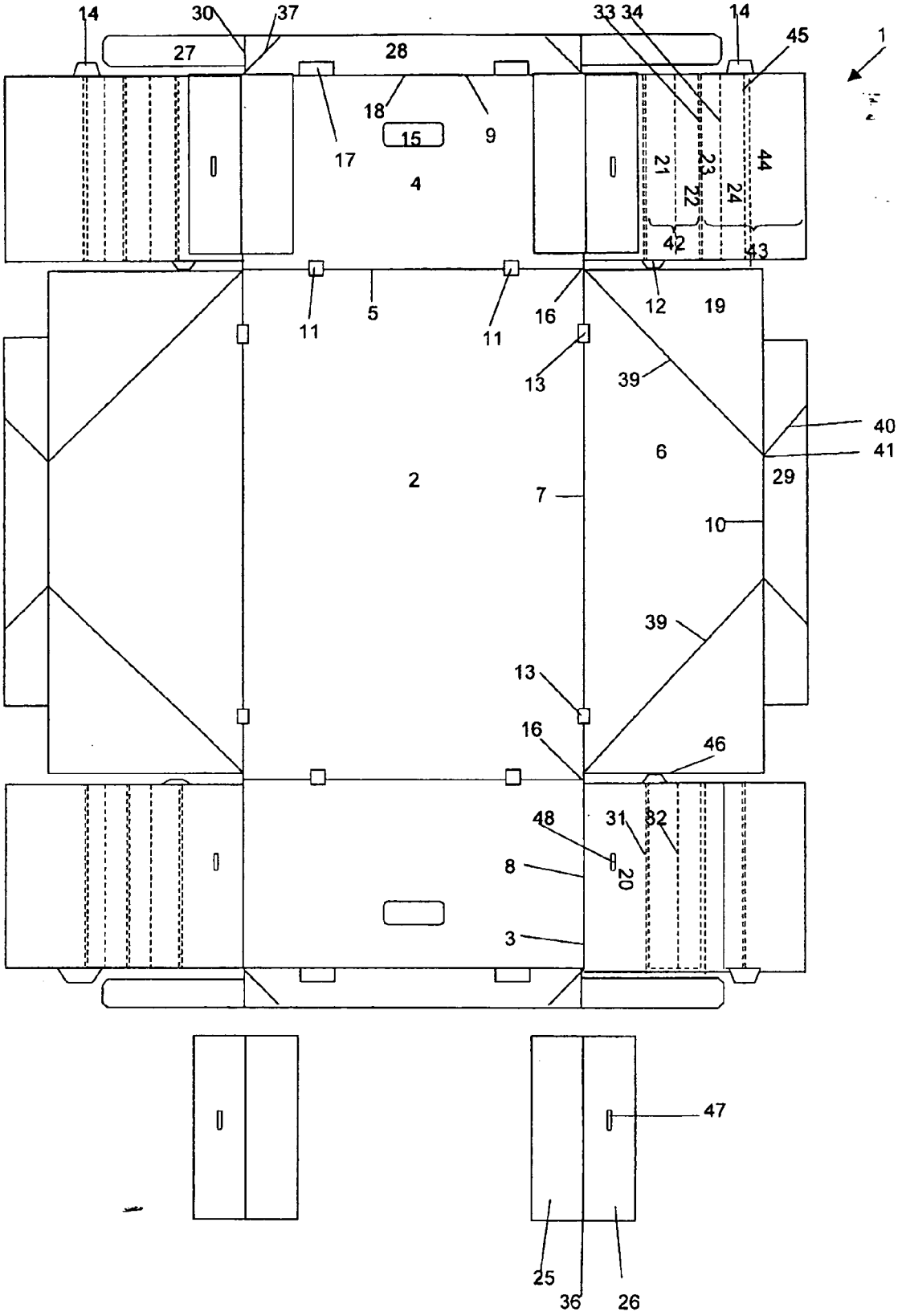
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Fig. 6

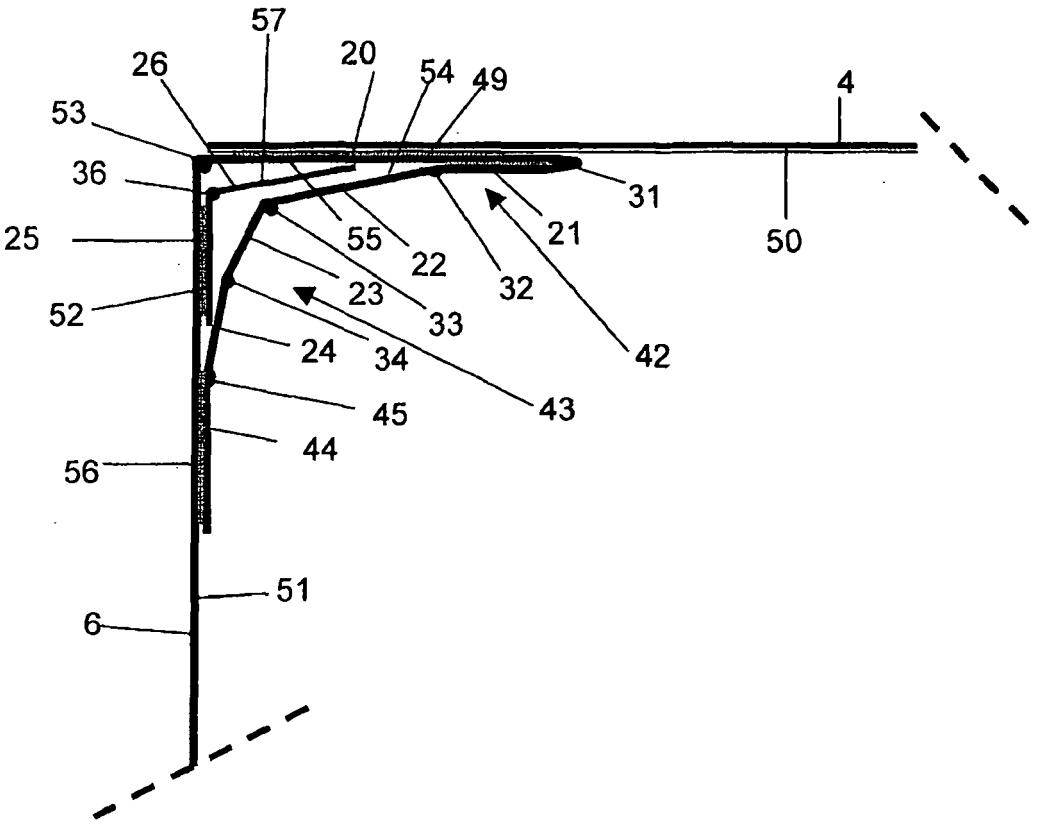
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Fig. 7

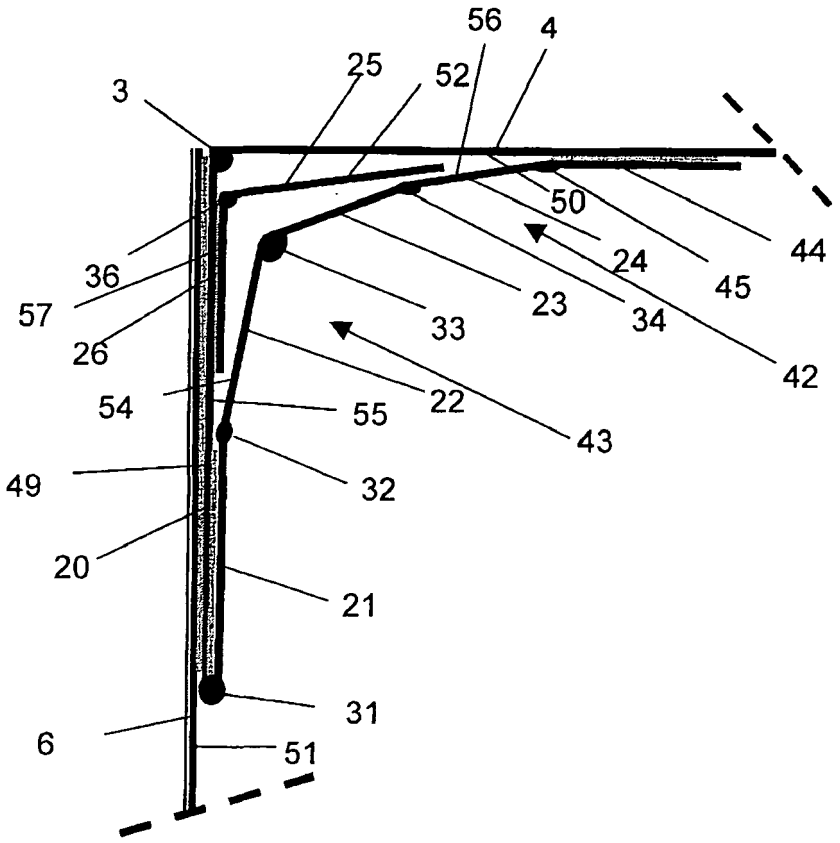
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Fig. 8A

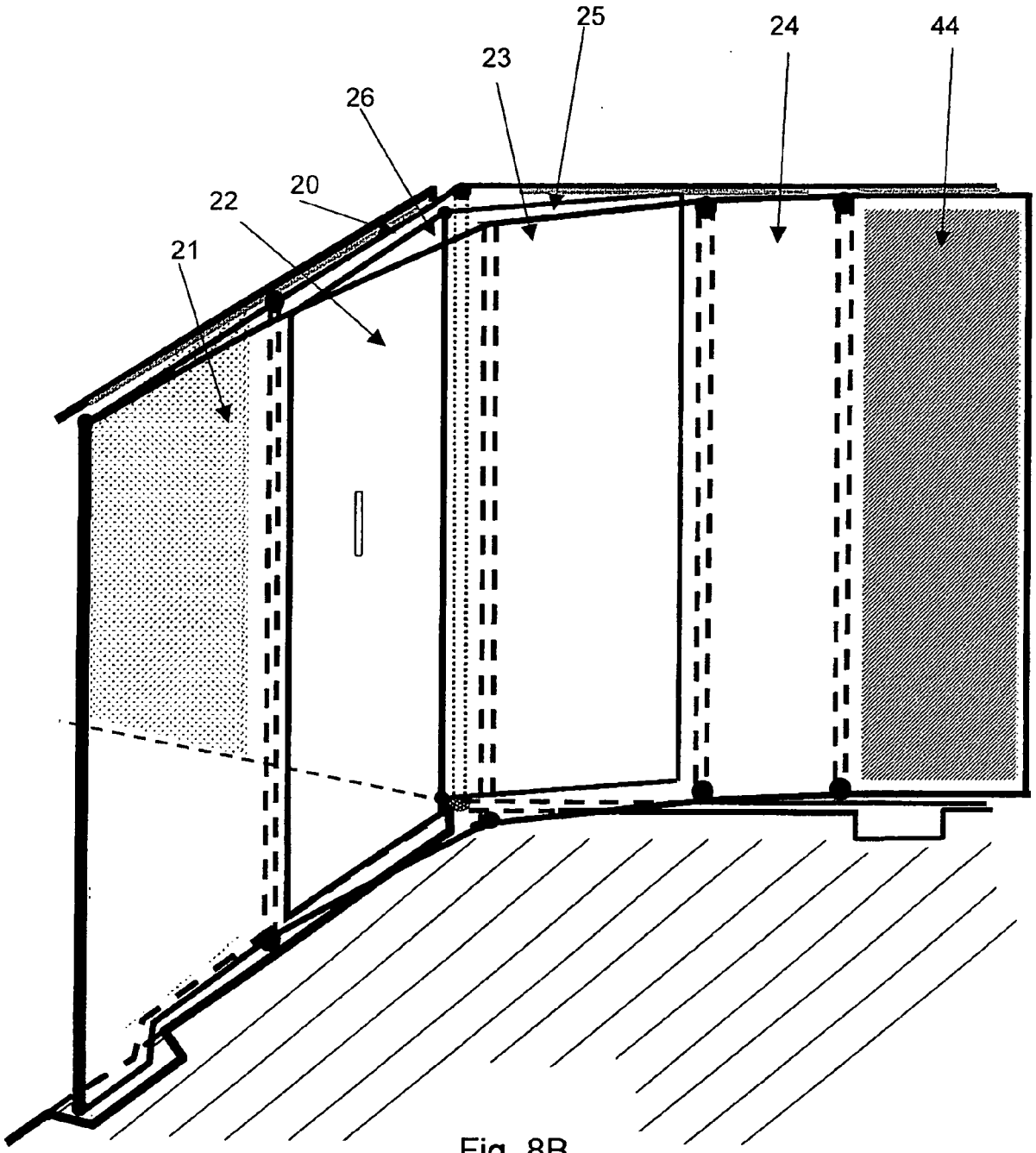

Fig. 8B

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 44 7205

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B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 February 2006	Augustin, W

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